ON THE RESTRICTION OF THE GENUS *FERDINA* GRAY (ASTEROIDEA).

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Plates xxi.-xxiv.

The study of a species of a genus believed to be new has led to a revision of its generic associates, with the result that some further information has been gathered which will, it is believed, throw some more light upon this little-known group.

Although Gray's specimens of *F. cumingii* and *F. flavescens* in the British Museum cannot be made available to me, I have been kindly supplied with helpful notes and photographs by the authorities of that institution.

It is considered that the species at present allotted to *Ferdina* should be separated and placed under two distinct genera. This would entail the restriction of *Ferdina* and the erection of a new genus, a course which is followed herein. In adopting the view that the genus *Ferdina* should be split I have been partially influenced by the additional information at hand and partly by the statement of H. L. Clark (1). "It seems to me quite possible that *cancellata* and its allies are not congeneric with *flavescens*." The species *cumingii* Gray, which is linked with *flavescens* in Clark's work, has been omitted from the quotation, for it is not related, as that author was led to surmise through Gray's deceptive descriptions.

F. cancellata Grube, is treated hereafter as a probable synonym of *F. cumingii* Gray.

The regrouping of the species is as follows:—

Family Ophidiasteridae Verrill.

Genus Ferdina Gray (restricted).

Ferdina Gray, Ann. Mag. Nat. Hist., 6, 1840, 282 (part).

Ferdina H. L. Clark, Ech. Fauna Torres Strait, Dept. Mar. Biol.. Carneg. Inst., Washington, x., 1921, 58 (and authors in part).

Genotype.—Ferdina flavescens Gray (*loc. cit.*). Designated by Fisher, 1919.

Generic diagnosis.—Abactinal plates not in regular longitudinal series. Papulae isolated and confined to abactinal surface. Adambulacral armature in a single series. Marginal, actinal and abactinal plates uniformly granulated, not bare, either wholly or partially. Abactinal plates not uniform in size and never arranged in any regular order or series, either longitudinally or transversely.

The species belonging to this genus as here understood are:—

Ferdina flavescens Gray.

Ferdina heffernanii sp. nov.

Ferdina flavescens Gray.

Ferdina flavescens Gray, Ann. Mag. Nat. Hist., 6, 1840, 282.

Ferdina flavescens de Loriol, Mem. Soc. Phys. Hist. Nat. Genève, xxix., No. 4, 1885, 47, pl. xv., figs. 8a-8e.

Ferdina flavescens H. L. Clark, Ech. Fauna Torres Strait, Dept. Mar. Biol. Carneg. Inst. Washington, x., 1921, 59.

Pl. xxi., fig. 4; Pl. xxii., figs. 1-3.

As the characters of this species are so well described and figured by de Loriol, and its history brought up to date by H. L. Clark, there is prac-

(1). Clark, H. L., Ech. Fauna, Torres Strait. Dept. Mar. Biol., Carneg. Inst., Washington, x., 1921, 58-59.

tically nothing I can add from the photographs before me. However, as the photographs are of Gray's type specimens, it has been considered advisable to reproduce them.

Photographs examined are of two specimens measuring as follows:—

R. = 26 mm. r. = 8.5 mm.
R. = 21 mm. r. = 8 mm.

The species is known only from Mauritius.

FERDINA HEFFERNANII (2) *sp. nov.*

Pl. xxiv., figs. 1-5.

Description.—Rays five, long and slender, tapering gradually. R. = 40 mm. r. = 7 mm. Br. = 7.5 mm. Disc and rays flat, interbrachial arcs subacute. Abactinal surface, exclusive of superomarginals, covered by plates ranging in diameter from 0.5 mm. to 2 mm. and not arranged in any regular order, either longitudinally or transversely. The largest plates, which are few in number, are, like their smaller fellows, evenly clothed in dense granules, but differ from these latter in having their central granules much larger and more conspicuous. The largest abactinal plates are strongly convex, while the smaller plates around them are nearly flat. No centrally naked plates occur anywhere on the specimen. In the figured type specimen some plates have been deliberately denuded to see if a plate similar in appearance to some of those in *cumingii* and allies could be produced. No such result was obtained, and in no way could the smooth bald effect so characteristic of *cumingii* be produced by rubbing away the granular covering.

Superomarginals 17-19 arranged in an irregular series, made up of alternating larger and smaller plates. The large plates of the series are strongly convex, and the smaller ones almost flat. The large plates are clothed in dense granules, coarsest centrally, while the smaller plates are evenly granulated all over. The alternation of the superomarginals is not perfect. The first superomarginal of each series is not conspicuously enlarged. Terminal plate very small, smooth, bare, slightly swollen, and bearing two or more terminal tubercles. Papulae isolated, not arranged in any regular order; confined to abactinal surface, though occasionally some may occur between the marginals.

Inferomarginals 18-21; they are of varying form, making a somewhat irregular series. Most are large and have their central granules enlarged as in the superomarginal series. Odd plates occur here and there between the marginals.

Adambulacral plates numerous, 50-68. Each is provided with two conical flat-sided furrow-spinelets which may be sharply pointed or blade-like. Further, each adambulacral plate bears, in addition to a wealth of small granules, a central conical spine-like granule, which is either absent or only ill-defined in plates near the mouth. Only two series of actinolateral plates occur. The first series runs almost the entire length of the ray, and numbers, in the largest rays, between 27 and 32. The second series is comprised of from 2-3 plates and ends between the second and third superomarginal. All actinolateral plates, except those near the mouth, are clothed in dense granules and bear centrally a mass of prominent granules conical in shape and distinctly larger in size than those anywhere else on the specimen. These granules on the actinolateral plates are so con-

(2). Named for N. S. Heffernan, Esq., formerly Deputy Commissioner for the Western Pacific, Honorary Correspondent to the Australian Museum. As a guest of this gentleman, the author and a colleague were able to accomplish extensive scientific work in the Santa Cruz Islands.

spicuous that they can be detected with the naked eye. Oral spinelets small, the innermost largest. Oral plates clearly defined by channel-like deficiencies in the granulation. No pedicellariae.

The colour in a dried condition is pale creamy brown.

This sea-star can at once be distinguished from its generic ally by its slender rays and form of granulation. It differs from species of *Fromia* in having no actinal papulae. It was collected alive on sand in a sheltered coral pool in about six feet of water at low tide. The common coral, *Fungia* sp., was found living in abundance nearby.

Locality.—S.E. side of Santa Cruz Island, Santa Cruz Group, Western Pacific. Collected by E. le G. Troughton and A. A. Livingstone, August, 1926. Type in Australian Museum, Reg. Number J. 5089.

Genus NEOFERDINA *nov.*

Ferdina Gray (*loc. cit.*) and authors—in part.

Genotype.—Ferdina cumingii Gray.

Diagnosis.—Papulae isolated. Some of the marginal and abactinal plates conspicuously bare, never all clothed in dense granules as in *Ferdina*. In some cases the bare and conspicuously convex plates on the abactinal surface may be arranged in transverse and longitudinal series. Superomarginals usually more conspicuous than in *Ferdina*.

The species allotted to this genus are:—

Neoferdina cumingii (Gray).
„ *glyptodisca* (Fisher).
„ *kuhlii* (M. and Tr.).
„ *offreti* (Koehler).
„ *ocellata* (H.L.C.).
„ *cancellata* (Grube).

Note.—N. cancellata is probably a synonym of *N. cumingii*.

NEOFERDINA CUMINGII (Gray).

Ferdina cumingii Gray, Ann. Mag. Nat. Hist., 6, 1840, 283.
? *Ferdina cumingii* Perrier, Rev. Stell. du Mus. d'Hist. Nat., Paris, 1875, 184.
Non Ferdina cumingii H. L. Clark, Ech. Fauna Torres Strait, Dept. Mar. Biol. Carneg. Inst. Washington, 1921, 59 (characters of species misunderstood owing to Gray's deceptive description).

Pl. xxi., figs. 1-3; Pl. xxiii., figs. 1-2.

As this species is now the genotype of the new genus *Neoferdina*, it is necessary for its structural characters to be made perfectly clear. In the past it has been an enigma to systematists, both in relation to type locality and points in structure. As it is not the custom for the British Museum authorities to lend type material, I have been favoured by notes and photographs as a substitute. These clear up essential points in structure, but naturally throw no light upon the true locality from whence the specimens came. On the other hand, the locality given to me by the authorities at the British Museum only confirm Gray's and Perrier's statements that they came from the "West Coast of Columbia." We are, therefore, no further advanced in the effort to substantiate the belief set out by H. L. Clark (*loc. cit.*) that the specimens possibly came from the Philippines.

As regards structure, however, much of the mystery existing can be cleared away. In the first place there is no doubt that the species is of the bare plated type, having many abactinal and marginal plates bare and smooth centrally. Furthermore, it so closely approaches the "*cancellata* group" that *cancellata* itself may be absorbed as a synonym, but a definite course on this point is not possible because the early literature, so vital to such a question, is not available to me. Sufficient information, however, is

before me to question the validity of *cancellata*. Where *cumingii* so closely links itself with *cancellata* is in the arrangement of the bare transverse plates on the abactinal surface of the rays. Fisher (1919) and H. L. Clark (*loc. cit.*) both give this character as a distinguishing feature for *cancellata*. Clark's *N. ocellata* is, I think at present, a valid species, but when further data are forthcoming it too may be reduced to a synonym of *cumingii*.

The following description of *N. cumingii* from notes and photographs will further show its close relationship with *cancellata*. Further, it is hoped that by its publication, together with the photographs, authors in possession of the earlier literature of *cancellata* will have an opportunity to prove or disprove my doubts as regards the status of the two species.

Description.—Disc and rays depressed; interbrachial arcs subacute. Abactinal surface covered by plates measuring between 0.5 and 2 mm. in diameter. These plates assume various degrees of convexity, though the largest of them are more strongly convex than their smaller fellows. The abactinal plates are not arranged in any regular order excepting a median radial series and a small number of transverse series. The plates of the median radial series in Gray's three specimens number anything between six and thirteen, according to the size of the specimen, and extend from the disc to the distal part of the ray, thereby differing from *N. ocellata* which has the median radial plates confined to the basal half of the ray. From five to six transverse series of tubercle-like plates, four to six plates in each series, occur on the abactinal surface of each ray, thereby agreeing with *cancellata*. In Gray's three specimens the superomarginal plates range from twelve to sixteen in number and are arranged in an alternating series of large and swollen and small and flatter plates. This alternating arrangement is not always perfect, as abnormalities occasionally occur.

As in other species, the transverse series of medium sized plates on the abactinal surface of each ray lie opposite the smaller superomarginals. The first superomarginal of each series is no larger than any of its fellows, therein differing from *N. ocellata* (H.L.C.) which has, as described by Clark and seen by me in specimens of the species in the collection of the Australian Museum, very large plates at the beginning of the series. The terminal plate is round and swollen. The inferomarginals correspond in number with the superomarginal series, and from the photographs seem to assume the same alternating arrangement.

Most marginals, median radials and plates of the transverse series are bare centrally, the granulation ending abruptly and conspicuously at or near their bases. The remaining plates on the abactinal surface are clothed in dense granules. Madreporite and anal aperture not sufficiently detailed in the photographs to describe.

Papulae fairly numerous, isolated and devoid of any regularity in arrangement.

Adambulacral plates numerous, squarish or occasionally rectangular. There are two adambulacral spinelets to each plate, according to the notes before me from the British Museum.

Three series of actinolateral plates are present. The plates of the series, like the adambulacrals, are densely granulated. The first series of actinolateral plates extends nearly to the tip of the ray. The second reaches the eighth inferomarginal, while the third ends between the third and fourth inferomarginal.

Actinal papulae absent.

Locality.—"West Coast of Columbia" (Gray).

Specimens examined.—Photographs of three of Gray's type specimens.

NEOFERDINA KUHLII (Muller and Troschel).

Scytaster kuhlii Muller and Troschel, Syst. der Asteriden, 1842, 36.
Ferdina kuhlii H. L. Clark, Ech. Fauna Torres Strait, Dept. Mar. Biol. Carneg. Inst. Washington, x., 1921, 61.

Acting upon the supposition that the type specimen or specimens of this species were in the collection of the Leyden Museum, application was made for the loan of them, but information received in answer shows that the type material, or any other species of the genus, is not housed in that institution.

EXPLANATION OF PLATES.

Plate xxi.

Fig. 1. *Neoferdina cumingii* (Gray). Abactinal view of one of Gray's type specimens. x2.
„ 2. *Neoferdina cumingii* (Gray). Actinal view of same specimen as fig. 1. x2.
„ 3. *Neoferdina cumingii* (Gray). Abactinal view of a small type specimen. x2.
„ 4. *Ferdina flavescens* (Gray). Abactinal view of one of Gray's type specimens. x2.

Plate xxii.

Fig. 1. *Ferdina flavescens* (Gray). Actinal view of same specimen as shown, Pl. 1, fig. 4. Absence of granules in one place obviously not natural. x2.
„ 2. *Ferdina flavescens* (Gray). Actinal surface of ray of one of Gray's type specimens. x6.
„ 3. *Ferdina flavescens* (Gray). Abactinal surface of ray. x6.

Plate xxiii.

Fig. 1. *Neoferdina cumingii* (Gray). Abactinal view of ray of one of Gray's type specimens. x6.
„ 2. *Neoferdina cumingii* (Gray). Actinal view of ray of one of Gray's type specimens. x6.

Plate xxiv.

Fig. 1. *Ferdina heffernanii* sp. nov. Portion of abactinal surface of ray. x6.
„ 2. *Ferdina heffernanii* sp. nov. Actinal surface in vicinity of mouth. x5.
„ 3. *Ferdina heffernanii* sp. nov. Portion of actinal surface of ray. x6
„ 4. *Ferdina heffernanii* sp. nov. Actinal view. Slightly over nat. size.
„ 5. *Ferdina heffernanii* sp. nov. Abactinal view. Slightly over nat. size.